

FRESHWATER NONGAME FISHES OF CALIFORNIA



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FRESHWATER
NONGAME FISHES
of California

by

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and

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NOTE TO READERS

This electronic document is a scanned version of the printed booklet that was very popular and offered free to the public for as long as it was in print. Funds have not been available for several years either for reprinting, or for revision. Nevertheless, the booklet contains information on freshwater fishes occurring in California that is as valid today as when originally written. Do keep in mind, however, that the document is old, so serious researchers are advised to consult libraries or Department of Fish and Game staff for up-to-date information on the species described, including protection status and current scientific names for these animals. Anglers should consult current fishing regulations for seasons, size and bag limits, or any other requirements for take of these animals.

FOREWORD

What person, pausing beside a pond or stream, has not sometimes watched small, finny creatures darting through aquatic forests or scurrying from rock to boulder, and wondered, "What kind of fish are these?" Most people know that several kinds of minnows exist, and they may even distinguish between "chubs" and "shiners." Few persons, however, appreciate the great variety of nongame fishes in our fresh waters, running the gamut from the secretive sculpin to the large, voracious squawfish.

A number of terms have been applied to the various kinds of nongame fishes, primarily because of their relationship to game fishes. Such terms as "rough fish" and "trash fish" are used when a species is suspected or known to be in competition with, or is in any way adversely affecting game fish populations. "Forage fish" are those that are eaten by game fish. "Bait fish" is a term used by fishermen to denote kinds of small fish used as bait for angling. It should be noted that most any species of nongame fish can fit into several of those categories, depending upon the circumstances in any particular water.

The fact that fish inhabit an environment foreign to us precludes all but the most casual observation of their habits by most people. Indeed, many of the nongame species are relative strangers even to professional fisheries workers, who must search through scattered publications for descriptions and illustrations of the various kinds. This booklet is intended to fill the long-felt need for a handbook describing and illustrating the various kinds of California's freshwater nongame species.

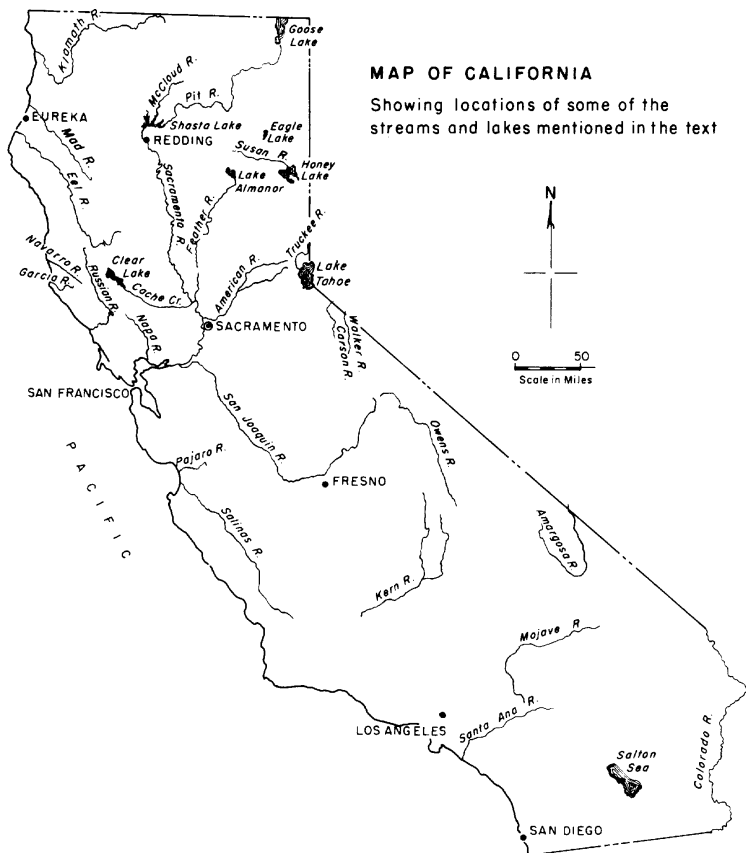
We must point out that it is frequently possible to observe fish doing things not recorded or at variance with the literature. It is possible for almost anyone to find things they can dispute with the experts. This adds considerable spice to the life of a "fish watcher."

In our discussion of the various species, we have attempted to point out some interesting facts, but certainly not all of them, and we welcome new observations.

In this booklet we have included as nongame fish all of the species that can normally be expected to occur in fresh water, and that are not regularly sought by anglers. This is a matter of judgment, since certain species included are, from time to time, the object of anglers' attentions. Most of them, however, are of minor importance.

TABLE OF CONTENTS

	Page
Foreword	2
Pacific Lamprey	6
Threadfin Shad	8
Pond Smelt	10
Suckers	11
Bigmouth Buffalo	12
Western Sucker	13
Santa Ana Mountain-sucker	15
Lost River Sucker	16
Humpback Sucker	17
Minnows	18
Carp	20
Goldfish	22
Tench	23
Golden Shiner	24
Sacramento Blackfish	26
Hardhead	27
Hitch	28
Sacramento Squawfish	30
Arroyo Chub	32
Splittail	34
Lahontan Redside	35
Western Roach	36
Tui Chub	37
Speckled Dace	39
Red Shiner	40
Fathead Minnow	41
Desert Pupfish	42
Mosquitofish	44
Logperch	46
Tule Perch	47
Riffle Sculpin	49
Threeipine Stickleback	51
Longjaw Mudsucker	53
Suggested Reading	54
Acknowledgments	54



CLASSIFICATION

There are two major groups of fishes. Those with cartilaginous skeletons, such as sharks and rays, live almost exclusively in ocean or brackish waters. Those with bony skeletons live both in marine and fresh waters, and are by far the more numerous. In addition, a group of more primitive animals, including the lampreys and hagfishes, are sometimes erroneously considered as fish.

A number of characteristics are used to classify fishes into separate categories. Most of these characteristics are external and quite obvious, although some are internal and not so easy to observe. Those external characteristics that are used to distinguish our freshwater nongame fishes are shown on the accompanying diagram.

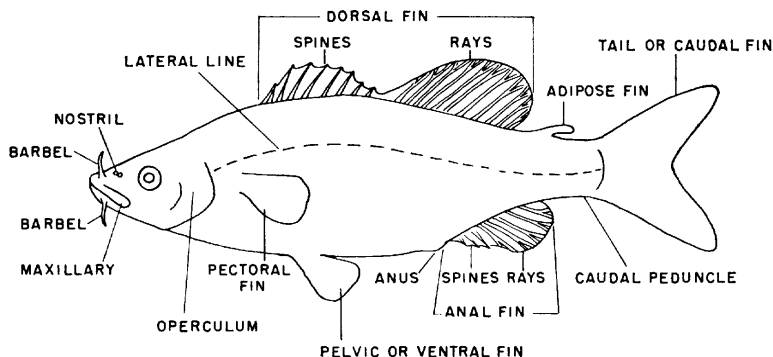
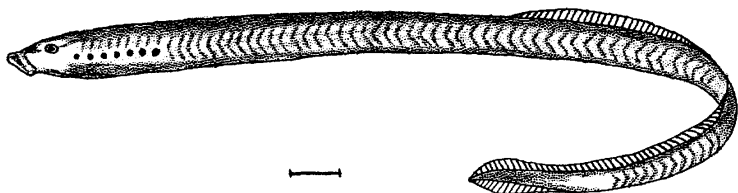


Diagram of a hypothetical fish, showing features mentioned in the text. (Not all of these features will be found on any one kind of fish.)

PACIFIC LAMPREY
Entosphenus tridentatus

Entosphenus = wedge-shaped
tridentatus = three-toothed



DISTINGUISHING CHARACTERISTICS

Lampreys are not true fish. They are the most primitive form of living vertebrates. They have no bones, the skeleton being composed of cartilage. Lampreys have long, round, eel-like bodies that are slimy to the touch. The head is short, with a round sucking mouth lacking functional jaws. The mouth is surrounded by a horny sucking disk. The tongue has rough, rasping teeth. There are no paired fins. A row of seven gill pores on each side of the body starts just behind the eye. Pacific lamprey adults attain a length of about two feet. They range in color from dark bluish to brownish grey.

DISTRIBUTION IN CALIFORNIA

The Pacific lamprey is found in nearly all California streams entering the Pacific Ocean, unless blocked by barriers or low flows. It ranges northward to Alaska.

GENERAL INFORMATION

The adults often start their spawning migration from the ocean into fresh water in the fall, and can be seen moving upstream throughout the winter and early spring except during high water. In some rivers these migrations continue into late spring.

Great, wriggling masses of lampreys are often seen ascending barriers and fish ladders on coastal streams in the early spring. They negotiate these barriers in a remarkable fashion. In many cases the flow is too great for the fish to move across the barrier in one attempt. They solve the problem by swimming until tired, then attaching themselves to the bottom or sides with their mouths and resting for a while. When recovered, they make another attempt and move upstream several more feet. In this manner, by successive spurts and resting periods, they move over various obstructions until they reach their spawning grounds.

Lampreys construct nests for spawning. They dig shallow depressions in stream riffles by moving stones with their suctorial mouth. The eggs are

deposited in the crevices of the rocky nest area, after which the adults die. The eggs hatch and the young lampreys burrow into the stream bottom, where they remain in a larval stage for three or four years. During this time, they feed on material they filter from the water and gradually change into miniature adults. At a length of about 6 inches, they move into the stream and migrate to the ocean. They may become parasitic at this time, or possibly wait until they reach salt water before attaching themselves to another fish for a feast. A landlocked population of Pacific lamprey is present in the Klamath River system above Copco Dam.

IMPORTANCE

The Pacific lamprey parasitizes other fishes, notably striped bass and salmon, but without the disastrous results caused by another species, the sea lamprey, to lake trout in the Great Lakes. Lampreys are edible, of good flavor, and are used as food particularly by some coastal Indian tribes. The flesh is rich and oily, ideal for smoking.

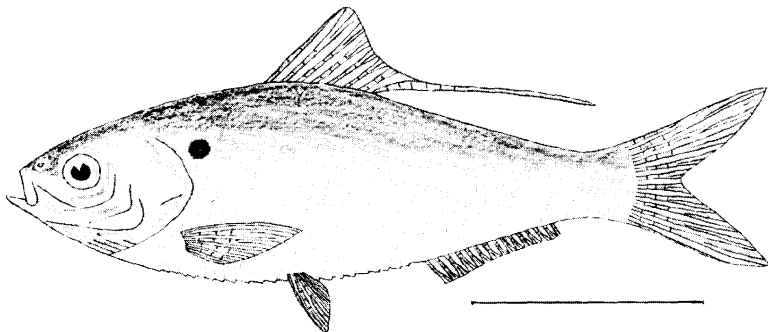
RELATED SPECIES

The river lamprey, *Lampetra ayresii*, (*Lampetra* = a sucker of stone; *ayresii* = after Dr. W. O Ayres) is a small parasitic form that is found from Central California northward at least as far as British Columbia. Very little is known of its habits or behavior. It is probably responsible for most of the lamprey attacks on fish in California streams.

The brook lamprey, *Lampetra planeri*, (*planeri* = after J. J. Planer, a German botanist) is the smallest of our lampreys. It occurs from California northward through Canada and Alaska into Siberia and Europe. It spends its entire life in fresh water instead of going to the sea upon changing to the adult form. It is nonparasitic and does not feed after reaching maturity.

THREADFIN SHAD *Dorosoma petenense*

Dorosoma = lance body
petenense = Lake Peten, Yucatan



DISTINGUISHING CHARACTERISTICS

The threadfin shad belongs to the herring family, which has both freshwater and marine representatives. It is a small, thin, silvery fish with a saw-toothed edge on the belly. It varies from yellowish green to bluish green on the back. A dark spot just behind the head is distinctive. The last dorsal fin ray is greatly elongated. The fins have a yellowish-green appearance in the water. The threadfin resembles a small American shad in shape. The stomach is gizzard-like.

DISTRIBUTION IN CALIFORNIA

Threadfin shad were introduced from Tennessee in 1953. They were put into San Vicente Reservoir, San Diego County, and Lake Havasu on the Colorado River to provide forage for game fish. They are now present throughout the Los Angeles Metropolitan Water District system and the area serviced by the All-American Canal. They have been introduced into numerous northern California reservoirs and are found also in the Sacramento-San Joaquin Delta.

GENERAL INFORMATION

Threadfin shad are known as "particulate" feeders; in other words, they select their food in the water. This is rather astonishing since the food consists of plankton organisms, many of which are no larger than the head of a small pin.

Threadfin spawn both in open water and near shore. The eggs are sticky and they cling to all manner of things. They can also develop and hatch

without ever touching anything. In one reservoir the eggs were found to sink to a point in the reservoir where their density maintained them in a specific temperature band. They hatched and for some days the helpless larvae could be captured by lowering a net to that depth. Some of the first threadfin shad eggs found in California were attached to the downy portion of a sea gull feather floating in San Vicente Reservoir. Threadfin spawn at intervals after the water temperature reaches about 70° F. and cease in the fall when the temperature drops below this. The eggs hatch in three days at 80° F. The larvae are long and string-like at first, looking nothing at all like the adults. They develop into slender eel-like fish until about half an inch long, when they assume the appearance of the adult.

Threadfin shad tend to travel in schools. Large numbers congregate at inlets, dam faces, and near obstructions in canals.

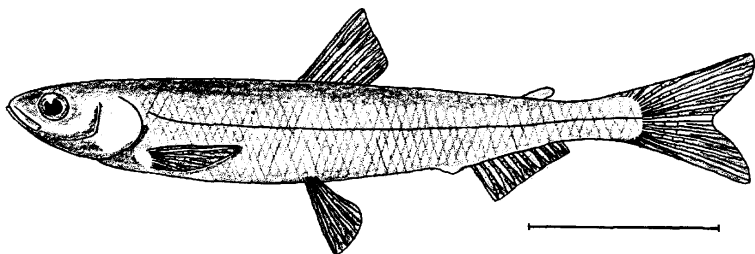
IMPORTANCE

It is an important forage fish, primarily for warmwater game fish such as bass and crappie, and for trout in certain waters.

POND SMELT

Hypomesus olidus

Hypomesus = below middle, referring to ventral fins
olidus = oily



DISTINGUISHING CHARACTERISTICS

The Pond smelt is a small, slender, silvery fish, belonging to the widespread smelt family. It has an adipose fin and a single soft dorsal fin. This species probably does not exceed five inches in length. The mouth does not reach beyond the middle of the eye.

DISTRIBUTION IN CALIFORNIA

The pond smelt ranges from San Francisco Bay northward around the northern Pacific to Japan. It is found in the Sacramento-San Joaquin Delta as far upstream as Stockton and Isleton. An entirely freshwater form was imported from Japan in 1959 as a forage fish for coldwater lakes and reservoirs. It is now present in Spaulding Reservoir, Nevada County and Freshwater Lagoon, Humboldt County.

IMPORTANCE

It is used by predators as a forage fish where it is abundant.

RELATED SPECIES

The Sacramento smelt, *Spirinchus thaleichthys* (*Spirinchus* = ancient name for smelt, *thaleichthys* = rich fish), is found in the San Francisco Bay and Delta region in California. The mouth is larger than in the pond smelt, with the maxillary extending beyond the back of the pupil. The pelvic fins are extremely large. This fish occasionally appears as "whitebait" in markets.

SUCKERS

Suckers and minnows comprise the largest groups of nongame fish in California's inland waters. Although suckers and minnows belong to different families, there is little obvious distinction between the two. Aside from the sucker's unique mouth, most of the characters describing suckers apply equally well to the minnows.

Suckers are bottom-dwellers. They usually have mouths directed downward, with heavy, warty lips. Suckers have no teeth in the mouth, scales on the head, adipose fin, muscular stomach, or spines in the fins. Comb-like teeth are located on a pair of sickle-shaped bones in the throat, where they work against a horny pad at the base of the skull.

Suckers have a wonderful hearing mechanism called the Weberian apparatus, derived from the first three vertebrae. A chain of four little bones on each side connects the air bladder with the lymph sacs of the inner ear. These bones presumably intensify sound impulses to the inner ear, using the air bladder as a collecting device or resonance chamber. The air bladder is connected to the throat.

Suckers inhabit both streams and lakes. Those that live in lakes usually move into streams in the spring to spawn. Occasionally, however, they spawn in lakes. For example, Tahoe suckers have been observed spawning simultaneously in Eagle Lake, Lassen County, and its tributary, Pine Creek.

Suckers' protractile mouths are admirably fitted for gathering food from the bottom mud and off plants, rocks, submerged trees, or other underwater objects. Their food consists mostly of insect larvae, algae and higher plants, and mollusks. They have highly developed senses of touch and taste which enable them to find food under the most adverse conditions.

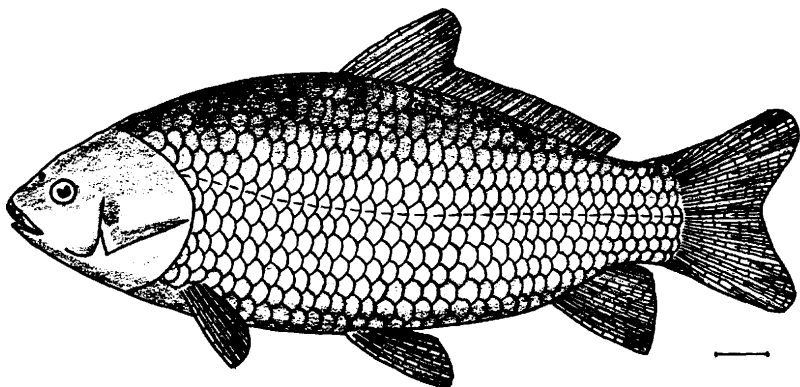
Suckers inhabit almost every kind of freshwater habitat in California. The natural habitat of the Tahoe sucker and mountain-sucker is trout water. The Sacramento western sucker occurs mainly in lowland rivers of the Central Valley. Suckers may approach the brackish water zone in the Sacramento-San Joaquin Delta. However, none tolerates salt water long.

BIGMOUTH BUFFALO

Ictiobus cyprinella

Ictiobus = fish bull

cyprinella = small carp



DISTINGUISHING CHARACTERISTICS

The body is robust and deep and the dorsal fin is long, with more than 25 rays. The mouth is large and oblique, with thin lips. The body color is bluish-green, often with a coppery tint above the lateral line, fading to cream color on the belly.

DISTRIBUTION IN CALIFORNIA

It is present in several reservoirs of the Los Angeles Aqueduct system in Los Angeles and Inyo counties.

GENERAL INFORMATION

This is the only non-native sucker in California. It was introduced illegally in the early 1940's, probably by commercial fishermen who wanted a source of fish nearer to the Los Angeles market. It reportedly reaches a weight of 80 pounds.

IMPORTANCE

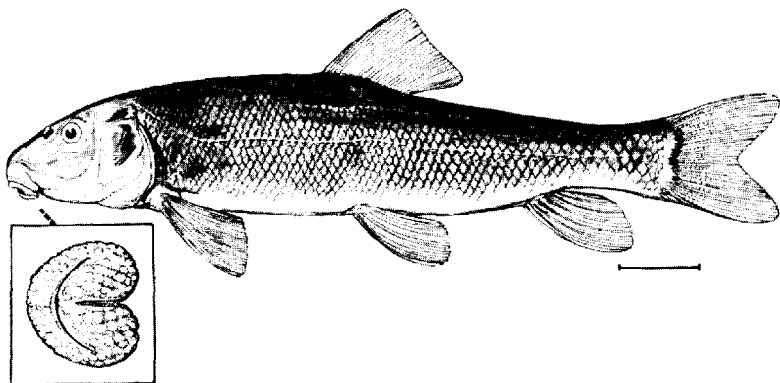
The buffalo almost never takes a hook, but is seined by commercial fishermen. It is an important food fish in the Mississippi drainage.

WESTERN SUCKER

Catostomus occidentalis

Catostomus = inferior mouth

occidentalis = western



DISTINGUISHING CHARACTERISTICS

The mouth is on the under side of the head. The lips are large, pendulous, and covered with papillae. There is a deep indentation in the middle of the lower lip. There are no cutting edges on the jaws.

GENERAL INFORMATION

Western suckers are believed to spawn only in streams, broadcasting their nonadhesive eggs over gravel with no prior preparation. They can often be seen grazing slowly over the bottom, picking up algae and other edible materials. They may reach a length of three feet, but the usual maximum is about two feet.

IMPORTANCE

Suckers may be present in a water and not seriously conflict with the sport fishery. They have, however, been known to compete for food with small trout. They are used as forage by predator fishes and act as scavengers.

RELATED SPECIES

There are eight species, one with two subspecies, of the genus *Catostomus* in California. Six of these species are very similar in appearance.

Sacramento western sucker, *Catostomus occidentalis occidentalis*; Russian River and Sacramento-San Joaquin drainages.

Goose Lake western sucker, *Catostomus occidentalis lacusanserinus* (*lacus* = lake *anserinus* = goose); Goose Lake, Modoc County, drainage.

Klamath largescale sucker, *Catostomus snyderi* (*snyderi* for J. O. Snyder, a California ichthyologist); Klamath River drainage.

Klamath smallscale sucker, *Catostomus rimiculus* (*rimiculus* = small fissure); also occurs in the Klamath River drainage and is the more numerous of the two.

Humboldt sucker, *Catostomus humboldtianus* (*humboldtianus* = Humboldt County); Eel, Mad, and Bear River drainages, Humboldt County.

Modoc sucker, *Catostomus microps* (*microps* = small eye); Pit River drainage in Modoc County.

Monterey sucker, *Catostomus mniotiltus* (*mniotiltus* = moss plucker); streams tributary to Monterey Bay.

The Tahoe sucker, *Catostomus tahoensis* (*tahoensis* = Lake Tahoe), is generally smaller than the western sucker. Males have a red stripe on each side that is prominent during the spawning season. It is found in the waters draining into northern Nevada, such as the Truckee and Carson rivers, Lake Tahoe, and also is now present in some waters of the Sacramento River drainage.

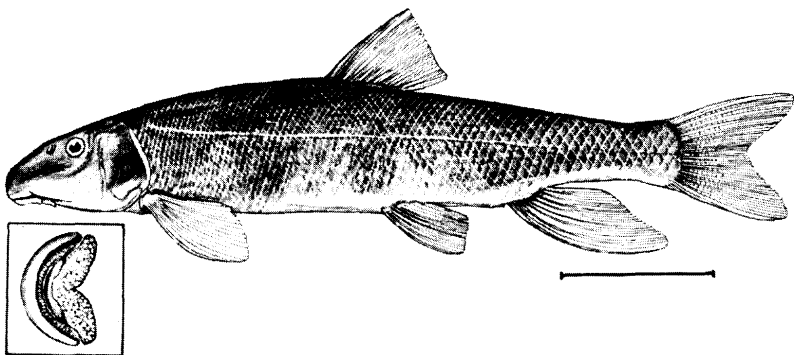
The flannelmouth sucker, *Catostomus latipinnis* (*latipinnis* = broad wing), has a large head, slender body, and a very large, pendulous mouth. It is found only in the Colorado River, where it is quite rare.

SANTA ANA MOUNTAIN-SUCKER

Pantosteus santaanae

Pantosteus = all bone

santaanae = Santa Ana River



DISTINGUISHING CHARACTERISTICS

Mountain-suckers can be distinguished from other kinds of suckers by the mouths. There are deep indentations at the junctions of the upper and lower lips, and broad, flattened, horny cutting edges on the jaws.

DISTRIBUTION IN CALIFORNIA

The Santa Ana mountain-sucker is found in the Santa Ana River and other southern California waters draining into the Pacific Ocean.

INTERESTING FACTS

Mountain-suckers are generally smaller than other species of suckers, individuals over a foot long being uncommon. They are found in rather shallow, cool, running water. They spawn in the spring, like other suckers.

IMPORTANCE

These suckers probably compete with small trout for food, but may be used as forage by larger trout.

RELATED SPECIES

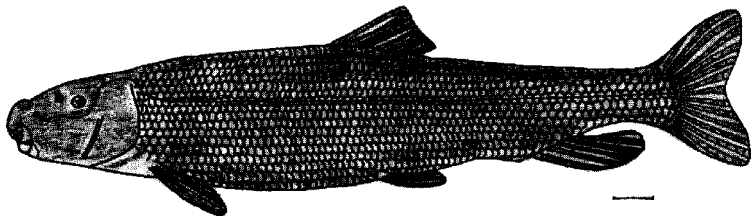
The Lahontan mountain-sucker, *Pantosteus lahontan* (*lahontan* = Lahontan drainage) is found in streams draining into Nevada and the North Fork of the Feather River.

LOST RIVER SUCKER

Deltistes luxatus

Deltistes = like Greek letter delta (Δ)

luxatus = put out of joint



DISTINGUISHING CHARACTERISTICS

The Lost River sucker is a large fish with a terminal, oblique mouth. The lips are thin, with few papillae. The snout has a pronounced hump.

DISTRIBUTION IN CALIFORNIA

It is restricted to a small area in the Klamath River drainage above Copco Dam.

IMPORTANCE

Very little is known of this fish. It probably has little effect on other species of fishes. It is rarely seen, except during spring spawning runs.

RELATED SPECIES

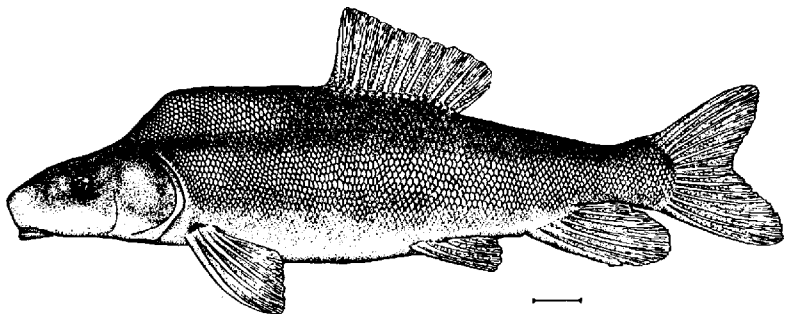
The shortnose sucker, *Chasmistes brevirostris* (*Chasmistes* = to yawn; *brevirostris* = short snout) is another large fish found in the same general area as the Lost River sucker. It differs from the latter in lacking a hump on the snout.

HUMPBACK SUCKER

Xyrauchen texanus

Xyrauchen = razor nape

texanus = Texas



DISTINGUISHING CHARACTERISTICS

This unique fish has a high, sharp-edged hump behind the head in the adult. The head is flattened on top. Otherwise it resembles the western sucker. The body is rather stout. Color is olive-brown above to yellowish on the belly. The head and hump are quite dark in breeding males.

DISTRIBUTION IN CALIFORNIA

It is restricted to the Colorado River drainage.

GENERAL INFORMATION

The humpback sucker grows to large size, reaching three feet in length and a weight of 16 pounds. It feeds on algae and immature insects. It has been known to hybridize with the flannelmouth sucker.

IMPORTANCE

It is now important only when young, as a forage fish. It was probably utilized as food by Indians along the Colorado River in years past, when it was more abundant.

MINNOWS

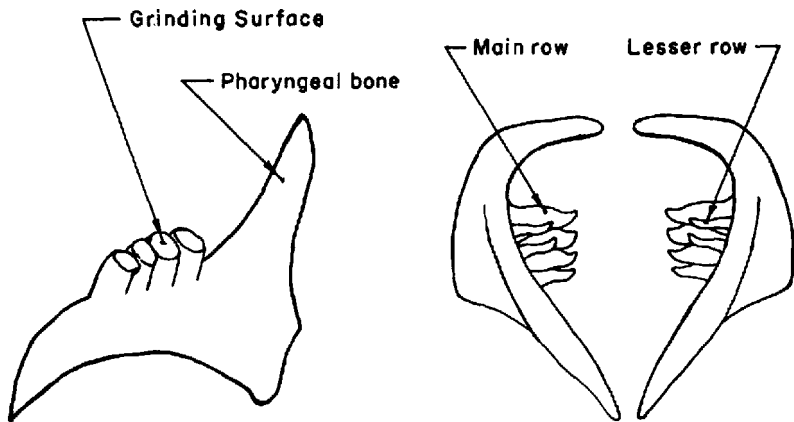
Minnows are the most numerous, both in kinds and numbers, of California's nongame fishes. Before the introduction of eastern game fishes, minnows dominated the State's freshwater fish populations.

Minnows, like suckers, are generalized fish without teeth in the mouth, scales on the head, adipose fin, muscular stomach, or, with the exception of a few kinds, spines in the fins. Minnows have throat teeth, but these are less numerous than those of the suckers.

The throat or pharyngeal teeth vary in number and shape. They may be pointed, hooked at the tips, serrated, molar-like, or even spoon-shaped. They are located on the modified fifth gill arch, deep in the throat. As a general rule, carnivores have pointed or hooked teeth, plankton feeders have comb-like teeth, and omnivores and vegetarians feature blunt or molar-like teeth. Different species of minnows are often distinguished most readily by their dental characteristics.

Pharyngeal bones can be removed by dissection, or, better, by carefully inserting a hooked needle behind the last gill opening under the shoulder girdle, hooking onto the pharyngeal bone, and gently pulling forward and outward. The teeth may be cleaned by teasing the flesh away with needles, or by scrubbing with a tooth brush. Care must be taken not to break off the teeth.

A hand lens is helpful in examining the teeth. In most cases a principal row of 4 or 5 larger teeth will be present, sometimes with a set of 1 or 2



Pharyngeal Teeth

The teeth to the left are 4-4, as found in goldfish. The formula for the teeth at the right is 2, 4-4.2, as in the speckled dace.

smaller ones in front. The two sides are usually, but not always, symmetrical. Thus, "teeth 2, 4-5, 1" indicates two rows of teeth on each bone, on the left side 4 in the principal row and 2 in the lesser; on the right side, 5 in the main row and 1 in the other. "Teeth 4-4" indicates a single row of 4 on each pharyngeal bone, and so on.

Minnows occupy many habitats, from cold trout streams to the remnants of the great tule marshes of the Sacramento-San Joaquin Delta. Several kinds will venture into brackish water, but none tolerates undiluted ocean water for long. Hence, many of our isolated coastal streams lacked native minnows or had distinctive populations.

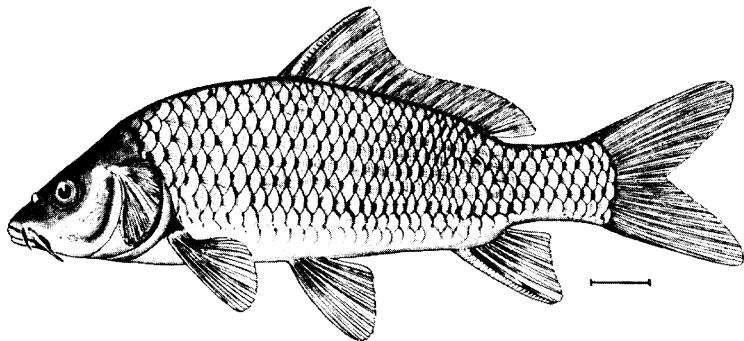
Clear-cut limitations in distribution are unknown for a number of species in California. Minnows such as tui chub and hitch have been widely transported as bait and now occur well outside their original ranges.

Water developments entailing large-scale transportation of water from one drainage to another also contribute to mixing of populations.

CARP

Cyprinus carpio

Cyprinus = ancient name for carp
carpio = carp



DISTINGUISHING CHARACTERISTICS

The body color ranges from brassy green to golden or yellow brassy to silver. The carp reaches a large size, with 20-pound individuals being common. It has a humped appearance and is quite heavy through the back. The scales are large. Occasionally, carp with only a few large scales are found. These are called mirror carp. A more rare variant in California has no scales at all and is called the leather carp. Carp have a long dorsal fin, the first ray of which is a heavy toothed spine. A similar spine occurs in the anal fin. The upper jaw has two barbels on each side. The molar-like pharyngeal teeth are in three rows, 1, 1, 3-3, 1, 1.

DISTRIBUTION IN CALIFORNIA

Carp were first introduced into California in 1872. Five individuals were imported from Holstein, Germany, and planted in ponds in Sonoma County. The species was soon being raised in large numbers for food. It now abounds in all of the lowland waters of the Central Valley, nearly all reservoirs in southern California, the Colorado River, and many small drainages in the coastal areas and the east slope of the Sierra Nevada. It is absent from some San Diego County reservoirs.

GENERAL INFORMATION

Carp eat animal matter, plant material, and mud. They are "rooters" and often keep the bottom stirred up so that the water remains muddy.

They enter the shallows in large numbers to spawn during the spring. At this time, they can be seen splashing and rolling with their backs out of the water. Carp are prolific breeders. Females weighing 15 to 20 pounds have produced 2,000,000 eggs in one season. They often severely overpopulate lakes and reservoirs. Carp prefer warm water, but large populations maintain themselves in Lake Almanor and other cool lakes, which also support trout. Carp are reported to reach a weight of 80 pounds. One fish reached an age of 47 years in captivity.

IMPORTANCE

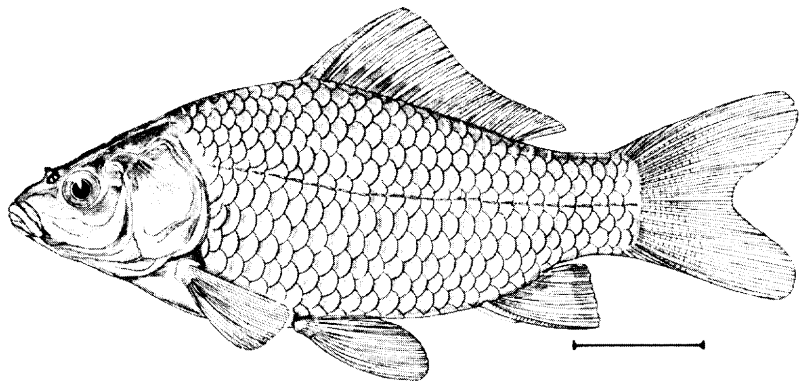
The carp is the biggest “pest” of the nongame fish. It destroys aquatic plants utilized by waterfowl, roils the water, causing silt-sensitive fish to disappear, and competes directly with game fish for food and space. Because it is an extremely hardy fish, it often overpopulates waters and depresses game species. Carp are the object of numerous expensive eradication programs in sport fishing waters.

Although it is considered an all-around pest by many sportsmen, fishermen are regularly seen seeking carp for food and sport. In addition to this relatively minor use, 220,972 pounds of carp were harvested in California by commercial fishermen in 1962.

GOLDFISH

Carassius auratus

Carassius = old name for Crucian carp
auratus = gilded



DISTINGUISHING CHARACTERISTICS

Goldfish resemble carp in body shape, but lack barbels. They have a long dorsal fin, and a heavy, toothed spine in the dorsal and the anal fins. The color is often gold or mottled gold, black, and silver. Goldfish planted in open waters tend to revert to the original olive green color. Pharyngeal teeth are 4-4 and molar-like.

DISTRIBUTION IN CALIFORNIA

Goldfish were introduced into California prior to 1900. They are now found in the lowland streams of the Central Valley, in various urban ponds and lakes, and in numerous waters in southern California.

GENERAL INFORMATION

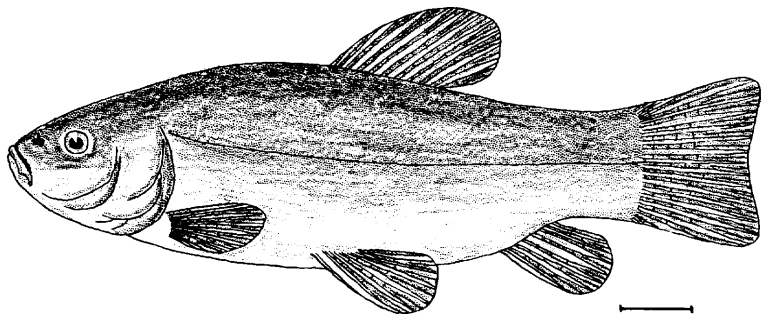
Goldfish feed on small animal and plant material. They are a popular aquarium fish, often used in back-yard fish ponds. They have been spread to numerous waters by individuals releasing them from home aquaria.

IMPORTANCE

Although smaller than carp, goldfish create much the same nuisance in trout lakes, from which they must sometimes be eradicated. They do not usually create a problem in warmwater lakes.

TENCH *Tinca tinca*

Tinca = Latin for tench



DISTINGUISHING CHARACTERISTICS

The tench has a robust body with small scales embedded in the thick skin. The color is usually greenish to golden, with dark blue on the head, and yellowish on the belly. This fish has one barbel at each side of the mouth. There are no spines in the fins. The pharyngeal teeth are 4 or 5-5 or 4, with slightly hooked tips.

DISTRIBUTION IN CALIFORNIA

Tench were introduced illegally from Italy in 1922 into a reservoir near Half Moon Bay. They have been spread to lakes in Santa Cruz and San Mateo counties and to the Trinity and Klamath rivers.

GENERAL INFORMATION

The tench is the largest of the European minnows. It lives in quiet rivers and small lakes or ponds. Spawning occurs in late spring and early summer, with large numbers of greenish-colored eggs produced. Food consists of detritus and small aquatic organisms.

IMPORTANCE

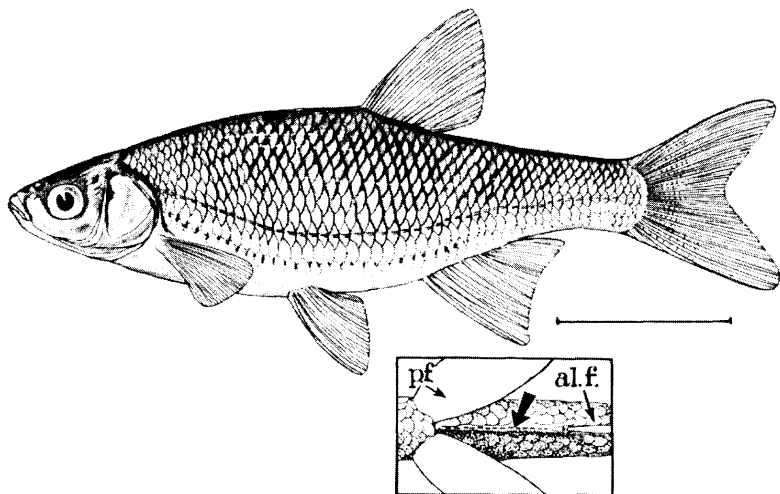
The tench is used as a food fish in Europe, but is of no importance here. It might cause problems in fish management similar to the carp and goldfish if allowed to spread to new waters in California.

GOLDEN SHINER

Notemigonus crysoleucas

Notemigonus = black half-angle

crysoleucas = gold-white



DISTINGUISHING CHARACTERISTICS

A small, flat-bodied minnow with greenish back, it has golden or silvery sides, and brass-colored belly. The fins are yellowish, or red in the breeding season. The scales are large. This species has a scaleless ridge or keel that extends from the pelvic to anal fins. The anal fin is sickle-shaped. The lateral line is strongly decurved. Teeth are 5-5, hooked, with a grinding surface.

DISTRIBUTION IN CALIFORNIA

The golden shiner was first imported from the eastern United States into San Diego County in 1891. It has become an important bait minnow in northern California since 1950, and is now established widely in the Sacramento-San Joaquin river system.

GENERAL INFORMATION

Golden shiners spawn in the spring and early summer. The adhesive eggs stick to vegetation or other objects. This species thrives in waters with heavy growths of aquatic vegetation.

It is said to destroy mosquito larvae in lakes efficiently.

IMPORTANCE

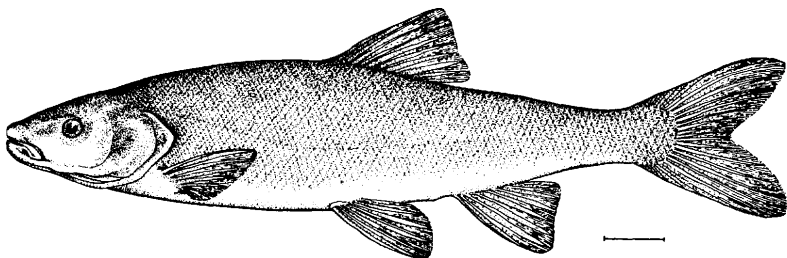
Golden shiners are raised in large numbers by commercial bait dealers and are utilized as forage by warmwater game species in waters in which they are present. They may have a detrimental effect on trout in cooler waters.

SACRAMENTO BLACKFISH

Orthodon microlepidotus

Orthodon = straight tooth

microlepidotus = small-scaled



DISTINGUISHING CHARACTERISTICS

The blackfish is a large, dark minnow with an upturned mouth. It is nearly round in cross section and has a conically-shaped head. It has small, fine scales. In Clear Lake, Lake County, it grows to a length of two feet. The pharyngeal teeth are 5-6 or 6-6, very long, and nearly straight.

DISTRIBUTION IN CALIFORNIA

It is found in the large natural lakes of central California, such as Clear Lake, and the lower slough-like reaches of the Sacramento and San Joaquin rivers and their associated drainages. It does not move into the swifter portions of the tributaries or into the foothill reaches of the rivers.

The blackfish reached its greatest abundance in the marshy, overflow areas, like Tulare Lake. It has been introduced into southern California.

GENERAL INFORMATION

Like the carp, it spawns in shallows and is a prolific egg producer. A 17-inch female contained an estimated 350,000 eggs. The growth rate is rapid. In Clear Lake, blackfish range from 2.5 to 6.5 inches in length at the end of their first growing season. It feeds on plankton and bottom materials.

IMPORTANCE

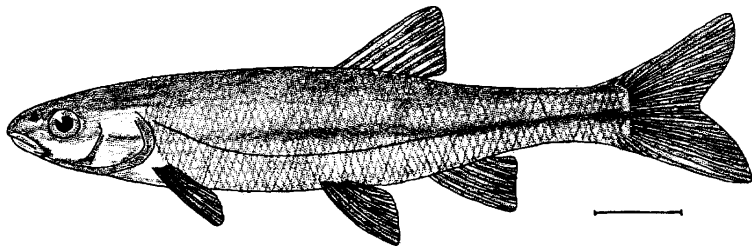
The blackfish is of minor commercial importance, with over 100,000 pounds harvested in 1962: Fish are trucked alive to fish markets in Oriental districts, where the buyers select fish and carry them home alive. The young of this species are eaten by game fishes.

HARDHEAD

Mylopharodon conocephalus

Mylopharodon = throat tooth grinder

conocephalus = cone head



DISTINGUISHING CHARACTERISTICS

This large native minnow attains a length of about two feet. It is slender, the body cross section is round, and it has a large mouth in a conical, somewhat flattened head. A piece of skin, called a frenum, joining the center of the upper lip to the head, distinguishes it from the squawfish, which it otherwise resembles. The color is a bronze green above, shading to cream on the belly. The pharyngeal teeth are 2, 5-4, 2. Two or three of the teeth in the main row are molar-like, bluntly rounded, and much enlarged.

DISTRIBUTION IN CALIFORNIA

It is found generally throughout the rivers of the Sacramento-San Joaquin drainage and in several isolated basins, such as the Russian River.

GENERAL INFORMATION

The hardhead is omnivorous, feeding upon insects when young and on small fish and aquatic plants when adult. The clearer foothill streams form its favored habitat. It spawns in the spring, although the spawning habits are not known. It is commonly associated with the Sacramento squawfish.

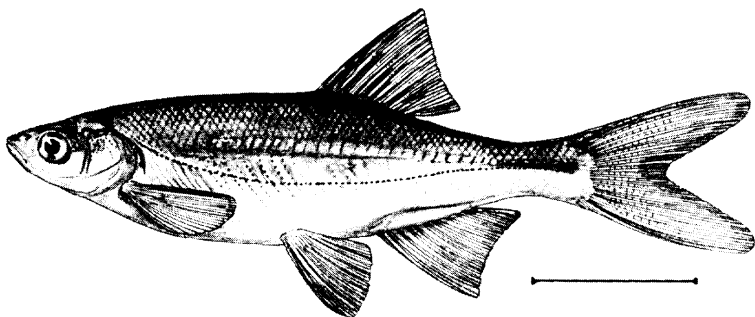
IMPORTANCE

When young, it is eaten by game fish. A few fish are taken each year by commercial fishermen.

HITCH

Lavinia exilicauda

Lavinia = a classical feminine name
exilicauda = slender toil



DISTINGUISHING CHARACTERISTICS

This native minnow has a deep, compressed body with a slender caudal peduncle. The head is small and conical, with a small mouth. The scales are large. The anal fin is longer and higher than in most native minnows. Males are smaller than females, and darker in coloration. The pharyngeal teeth are 4-5 or 5-5, long and compressed, with hooked tips and narrow, well-developed grinding surfaces.

DISTRIBUTION IN CALIFORNIA

Two subspecies of hitch are found in California:

The Sacramento hitch, *Lavinia exilicauda exilicauda*, is found throughout the lowland streams and lakes of the Central Valley, in Clear Lake, and in the Russian River.

The Monterey hitch, *Lavinia exilicauda harengus* (*harengus* = herring), inhabits streams tributary to Monterey Bay.

GENERAL INFORMATION

The hitch spawns mainly in streams, running up small creeks during early spring rains. In Clear Lake, this species has been observed spawning on gravelly shores. The hitch is prolific. A 10-inch female had 112,000 eggs. Young hitch feed on small animal plankton and insects along the shore. Adults eat plankton in the open waters. It lives in lowland streams, sloughs, and lakes, usually avoiding swift waters. Hitch grow rapidly, averaging about 5.5 inches long at the end of the first year's growth.

IMPORTANCE

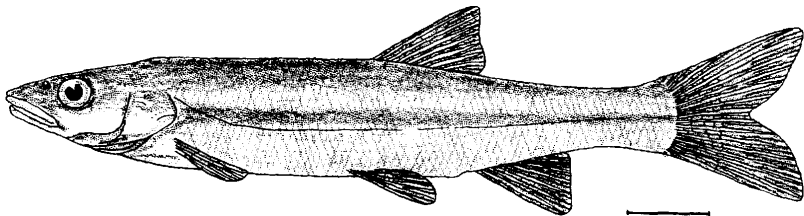
The hitch was an important bait minnow before regulations against the capture, sale, and use of wild minnows were adopted. It has been the object of a number of expensive eradication programs where it interfered with sport fisheries. The young provide forage for warmwater game fish.

SACRAMENTO SQUAWFISH

Ptychocheilus grandis

Ptychocheilus = folded lip

grandis = large



DISTINGUISHING CHARACTERISTICS

The squawfish is a slender minnow, somewhat pike-like in appearance but with a toothless mouth. It may attain a length of three feet or more. The color is olive or brownish green above to silvery on the belly. There are usually a few silvery or reflecting scales in the darker portion that flash in the sunlight as the fish swims. The fins are often reddish-orange. The throat teeth are 2, 5-4, 2, long and sharp.

DISTRIBUTION IN CALIFORNIA

It is present in the streams and lakes throughout the Central Valley, the Russian River, and the streams tributary to Monterey Bay.

GENERAL INFORMATION

The squawfish is extremely predatory as it becomes larger. The smaller fish eat mainly insects. This species usually spawns in streams, although one population in a Modoc County reservoir spawns successfully on the shore. The Sacramento squawfish prefers the less turbid rivers and streams. Heavy silt pollution for long periods will cause them to disappear. They range well up into many foothill streams, where they are commonly associated with smallmouth bass. The most common native associate is the hardhead.

IMPORTANCE

It is an important predator on small steelhead in the Russian River. Elsewhere, it preys heavily on resident trout. It takes artificial lures readily and the larger individuals offer some sport, although their stamina is short-lived.

RELATED SPECIES

The Colorado River squawfish, *Ptychocheilus lucius* (*lucius* = pike), resembles the Sacramento species, but has a more flattened profile, larger

mouth, and relatively smaller eyes. It reputedly reaches a length of five feet and a weight of 80 pounds. It is restricted to the Colorado River and its tributaries.

It was once an important food fish of the Indians, and later the white settlers. It was called “white salmon” by the early settlers because of its great size and periodic upstream migrations.

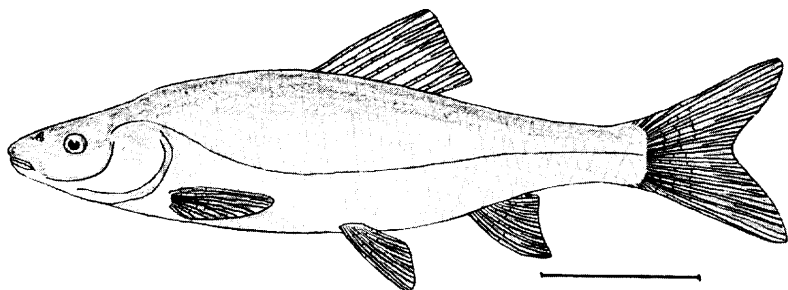
Construction of dams on the Colorado River has blocked regular migrations, severely reducing its numbers. It is of no sport or economic importance now, but is a unique and interesting species.

ARROYO CHUB

Gila orcuttii

Gila = Gila River

orcuttii = Charles Russell Orcutt, botanist who collected it.



DISTINGUISHING CHARACTERISTICS

This is a small, heavy bodied minnow, grey-green to olive green on the back, shading to nearly white on the belly. The throat teeth are in two rows, and can be 2, 4-4, 2, 2, 5-4, 2, 2, 4-4, 1, or 2, 5-4, 1. They are closely set, narrow, hooked, and without grinding surfaces.

DISTRIBUTION IN CALIFORNIA

It is found in the coastal streams of southern California. Its range has been restricted by water developments and extended, in some instances, by unauthorized introductions. It has been introduced into the Mojave River, where it hybridized readily with a related species, the Mojave chub.

GENERAL INFORMATION

The chub spawns in the spring in either streams or lakes. It feeds on insects and, in lakes, also on plankton. It grows only to 4 or 5 inches in small streams, but to 10 or 12 inches in lakes.

IMPORTANCE

It is of limited value as forage for predator sport fish, such as largemouth bass. It competes with trout for food and space in some southern California waters.

RELATED SPECIES

A similar minnow, growing to a larger size than the Arroyo chub, is the Klamath chub, *Gila bicolor* (*bicolor* = two-colored), of the Klamath River drainage. Its habits resemble those of the southern species.

The thicktail chub, *Gila crassicauda* (*crassicauda* = fat-tail), is found in the lower reaches of the Sacramento-San Joaquin rivers. It is extremely

rare and little is known of its habits. It grows to a length of at least 12 inches.

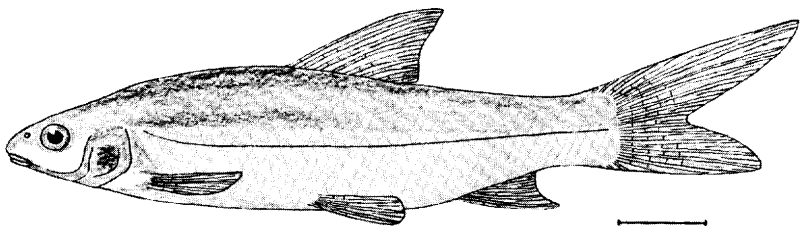
The Colorado River bonytail chub, *Gila robusta elegans* (*robusta* = stout, *elegans* = elegant), is restricted to the Colorado River. It is unusual in appearance, with a very long, slender tail section, an elevated dorsal profile with a pronounced hump, and a somewhat flattened snout with a small mouth. The fins are long and sickle-shaped, and the eyes are small and placed low on the head. It is now extremely rare in California.

SPLITTAIL

Pogonichthys macrolepidotus

Pogonichthys = beard fish

macrolepidotus = large scales



DISTINGUISHING CHARACTERISTICS

The splittail is a large-scaled, slender minnow. It has a small head with one barbel on each end of the upper jaw. The upper lobe of the tail is noticeably longer than the lower. The throat teeth are 2, 5-5, 2, hooked, and with well-marked grinding surfaces.

DISTRIBUTION IN CALIFORNIA

The range is the lower Sacramento and San Joaquin rivers and the Russian River. It is now rare in Clear Lake, Lake County, where it was once common.

GENERAL INFORMATION

The splittail inhabits the lower portions of the larger rivers and moves readily into brackish water. No work has been done on its food habits, but, from the appearance of its throat teeth, gill rakers, and intestinal tract, it probably feeds on insects and plankton. It reportedly spawns in the early spring.

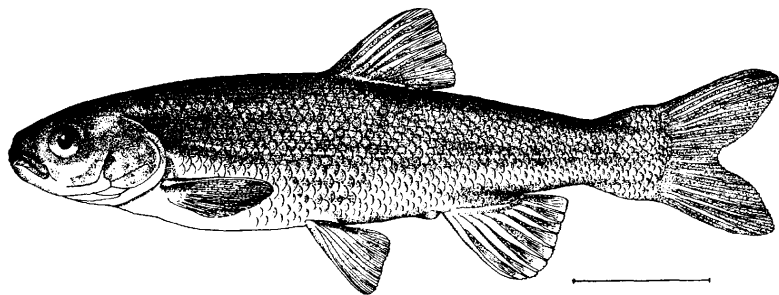
IMPORTANCE

It is of minor importance as a forage species. Small numbers are taken by commercial fishermen in the Sacramento-San Joaquin Delta area, 1,580 pounds being reported in 1962.

LAHONTAN REDSIDE

Richardsonius egregius

Richardsonius = in honor of Sir John Richardson
egregius = surprising, elegant



DISTINGUISHING CHARACTERISTICS

This is a small minnow with a terminal, downward slanting mouth that reaches to a point even with the front of the eye. A dark stripe along the side is characteristic. A parallel pink or red band is especially prominent during the spawning season. Pharyngeal teeth are 2, 5-4, 2, without grinding surfaces.

DISTRIBUTION IN CALIFORNIA

The redbside is found in certain of the higher elevation streams and lakes from the American River northward, and in streams draining into Nevada.

GENERAL INFORMATION

Its food probably consists mainly of small aquatic organisms, such as insect larvae and adults. It is primarily a stream spawner, but upon occasion may spawn in lakes. Spawning takes place in the spring. It has been reported to hybridize with the chub in Lake Tahoe.

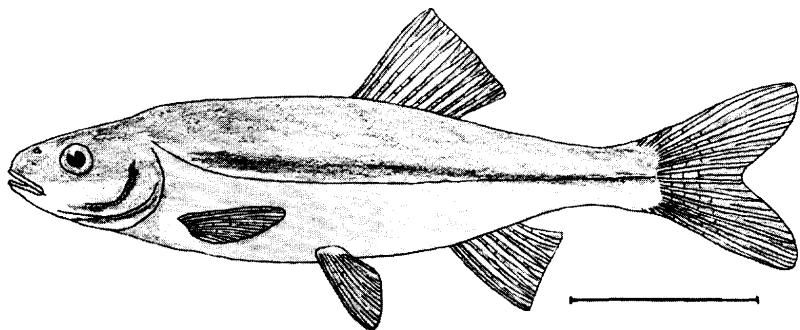
IMPORTANCE

This species competes directly with small trout for food. It provides forage for larger trout, and is used for bait in Lake Tahoe.

WESTERN ROACH

Hesperoleucus symmetricus

Hesperoleucus = white evening star
symmetricus = symmetrical



DISTINGUISHING CHARACTERISTICS

The western roach rarely exceeds five inches in length. The head and eyes are large. The mouth is small and low. The dorsal fin is set well back. The throat teeth are 4-5, narrow, with well-developed grinding surfaces and slightly hooked tips.

DISTRIBUTION IN CALIFORNIA

There are six roaches in California, all very similar in appearance:

Sacramento western roach, *Hesperoleucus symmetricus symmetricus*, in the Sacramento-San Joaquin drainage.

Monterey western roach, *Hesperoleucus symmetricus subditis* (*subditis* = pair below), in streams tributary to Monterey Bay.

Northern roach, *Hesperoleucus mitrulus* (*mitrulus* = a cap), in streams tributary to Goose Lake, Modoc County.

Venus roach, *Hesperoleucus venustus* (*venustus* = akin to Venus), in the Russian River and streams tributary to San Francisco Bay.

Navarro roach, *Hesperoleucus navarroensis* (*navarroensis* = the Navarro River), in the Navarro River, Mendocino County.

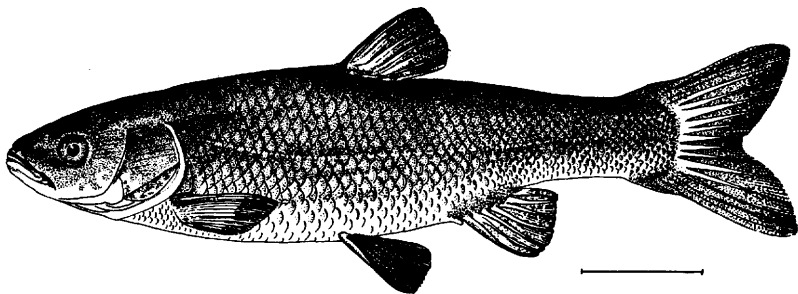
Gualala roach, *Hesperoleucus parvipinnis* (*parvipinnis* = small wing; i.e., fin), in the Gualala River, Mendocino and Sonoma counties.

GENERAL INFORMATION

Small stream dwellers, roach spawn in the early spring, depositing several hundred to nearly a thousand adhesive eggs, in shallow water over rocks or large gravel. They feed primarily on insects and crustaceans, but will take algae. In Coyote Creek, Santa Clara County, roach grow about one inch a year.

TUI CHUB
Siphateles bicolor

Siphateles = far
bicolor = two-colored



DISTINGUISHING CHARACTERISTICS

This minnow varies in size. Large specimens (10 inches) tend to be heavy and robust. The head is large and conical, but somewhat flattened on the sides. Small specimens tend to be slender and generally streamlined. The caudal peduncle is heavy.

The color is also variable, but tends toward olive green above and white to yellow-white below. Brassy green and occasionally silvery green dorsal areas are seen.

Pharyngeal teeth are in one row, 4-5 or 5-4 or 5-5.

DISTRIBUTION IN CALIFORNIA

Four subspecies occur in California:

Klamath tui chub, *Siphateles bicolor bicolor*, in the Klamath River drainage.

Sacramento tui chub, *Siphateles bicolor formosus* (*formosus* = beautiful), in the Sacramento-San Joaquin River drainage.

Coarseraker tui chub, *Siphateles bicolor obesus* (*obesus* = fat), in east slope of the Sierra Nevada drainages north of Mono County.

Fineraker tui chub, *Siphateles bicolor pectinifer* (*pectinifer* = comb-like, i.e., pertaining to the gill rakers), in east slope waters of the Sierra Nevada north of Mono County.

GENERAL INFORMATION

Food consists of plankton, insects, some plant material, and small organisms such as fish larvae.

The tui chub inhabits lakes and the quiet waters of larger streams, frequently traveling in large schools. Spawning occurs in the spring when water temperatures reach about 60 degrees F. The eggs are adhesive.

Where adequate checks, such as predation, do not exist, the species readily overpopulates.

IMPORTANCE

The tui chub is one of the most serious competitors of trout in lakes. It may provide forage for black bass, and occasionally for large trout. There was once a commercial fishery for this species in Eagle Lake, Lassen County.

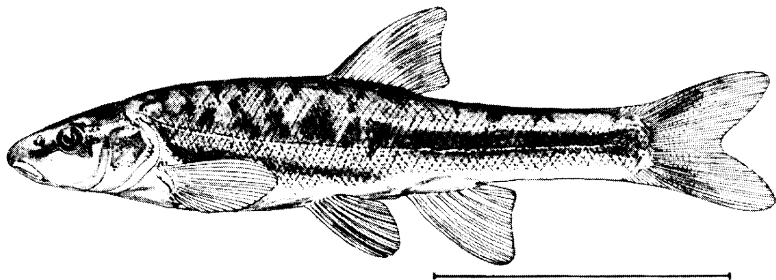
RELATED SPECIES

The Mohave chub, *Siphateles mohavensis* (mohavensis = Mojave River), resembles the tui chub. It occurs in the Mojave River, San Bernardino County, where it is quite rare.

SPECKLED DACE

Rhinichthys osculus

Rhinichthys = snout fish
osculus = small mouthed



DISTINGUISHING CHARACTERISTICS

The speckled dace is a small, slender minnow, with a stout tail, a small mouth slightly under a pointed nose, and small scales. It is variable in color, ranging from brownish to yellowish green, with darker blotches on the side. The blotches often form an untidy lateral band. During spawning, the fins have reddish tints. The pharyngeal teeth are 1 or 2, 4-4, 2 or 1, are hooked, and have a grinding surface.

DISTRIBUTION IN CALIFORNIA

Four subspecies are found in California:

Lahontan speckled dace, *Rhinichthys osculus robustus* (*robustus* = stout), in east slope of the Sierra Nevada drainages.

Pacific speckled dace, *Rhinichthys osculus carringtonii* (*carringtonii* = for Campbell Carrington), in the Sacramento-San Joaquin River drainage.

Klamath speckled dace, *Rhinichthys osculus klamathensis* (*klamathensis* = Klamath River), in the Klamath River drainage.

Nevada speckled dace, *Rhinichthys osculus nevadensis* (*nevadensis* = of the State of Nevada), restricted in California to Death Valley.

GENERAL INFORMATION

These secretive, small fish are found on riffles in small streams. They feed on bottom materials and small insects. Spawning occurs in the spring, with a few large eggs being deposited in riffle areas or over rocks or gravel. Dace also inhabit the shore areas of lakes where cover in the form of rock and gravel is abundant. They are not schooling fish.

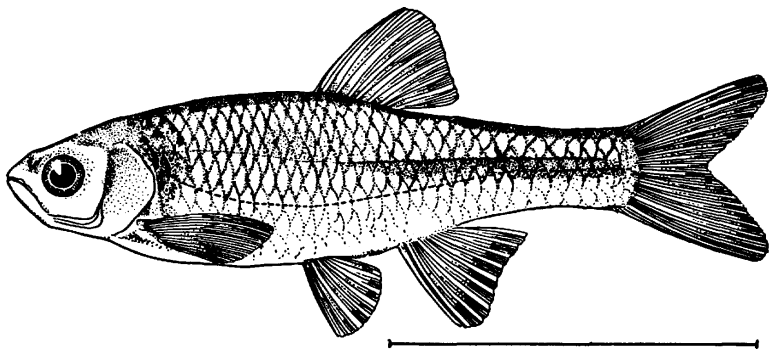
IMPORTANCE

Dace may be of minor importance as forage for large trout. They may compete with fingerling trout for food.

RED SHINER
Notropis lutrensis

Notropis = keel back

lutrensis = otter, i.e., from Offer Creek, Arkansas, where it was first collected.



DISTINGUISHING CHARACTERISTICS

The red shiner is a deep-bodied, robust minnow with a dark back, silvery blue sides, and red fins. It is one of the smallest minnows, rarely growing beyond about three inches. The coloring heightens during the spawning season. The teeth are 4.4, hooked, and sharp-edged or with very narrow grinding surfaces.

DISTRIBUTION IN CALIFORNIA

It was brought into northern California as a bait minnow in **1953**, but proved unsuitable. It is well established in the Colorado River. It is native to the central and southwestern United States in waters draining into the Mississippi and Rio Grande rivers.

GENERAL INFORMATION

This species spawns on sandy bottoms in shallow water. It requires warmer water than either the fathead minnow or the golden shiner. It does equally well in streams or lakes and tolerates muddy waters.

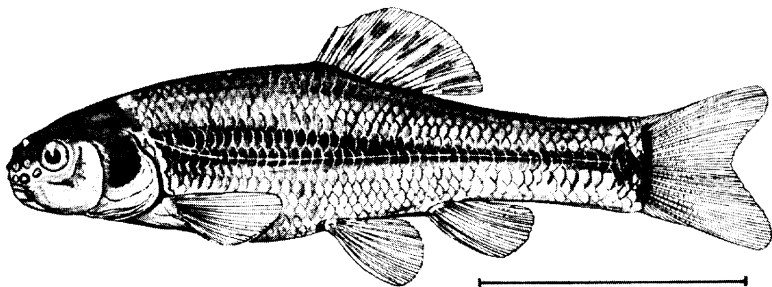
IMPORTANCE

The red shiner has been used as a bait minnow, and is eaten by game fish.

FATHEAD MINNOW

Pimephales promelas

Pimephales = fathead
promelas = black before



DISTINGUISHING CHARACTERISTICS

A small minnow, it is dark olive above with tinges of brass behind the head and tan along sides. A dusky crossbar usually occurs in the middle of the dorsal fin, with a dark blotch near the base of this fin in breeding males. The head is quite blunt and, in the breeding male, covered with small tubercles. The teeth are 4-4, with oblique grinding surfaces, and usually only one of the teeth is hooked.

DISTRIBUTION IN CALIFORNIA

It was planted into California waters in 1953 as an experimental bait and forage fish. It is raised by commercial bait dealers in the Central Valley.

GENERAL INFORMATION

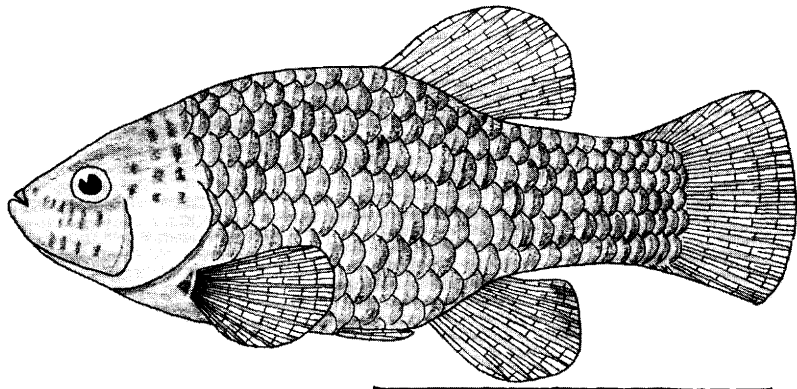
The fathead is a spring spawner. Each female lays several hundred to a thousand eggs on the underside of flat objects, such as boards and rocks. The food consists of microscopic plants and animals and small insects.

IMPORTANCE

It is of considerable importance as a bait fish and is utilized for forage in waters where it is present.

DESERT PUPFISH *Cyprinodon macularius*

Cyprinodon =tooth carp
macularius = spotty



DISTINGUISHING CHARACTERISTICS

Pupfish are small, stout members of the killifish family. The terminal mouth is small but well formed, with scissor-like teeth. The snout is short and rounded. The scales are very large. Coloring is variable, from brilliant blue to metallic grey. The belly occasionally shades to silvery white. The sides may or may not be crossed with dark bands.

DISTRIBUTION IN CALIFORNIA

The desert pupfish is confined to the basin of the lower Colorado River and the Salton Sea area.

GENERAL INFORMATION

A belligerent little fish, the pupfish feeds upon small insects, snails, or crustaceans. It can inhabit a wide variety of waters, ranging from fresh to highly saline, and up to 91 degrees F. A large population thrives around the shores of the Salton Sea, Imperial County. Pupfish are often found in warm springs.

IMPORTANCE

The desert pupfish is a unique native species of unusual interest. It is an attractive aquarium fish, but is too belligerent for community tanks.

RELATED SPECIES

One killifish and three other species of pupfish, one of which has four subspecies, are found in California:

The Saratoga Nevada pupfish, *Cyprinodon nevadensis nevadensis* (*nevadensis* = of the State of Nevada), is found only in the Saratoga Springs area of San Bernardino County in Death Valley National Monument.

The Amargosa Nevada pupfish, *Cyprinodon nevadensis amargosae* (*amargosae* = Amargosa River), is confined to the Amargosa River, San Bernardino County.

The Tecopa Nevada pupfish, *Cyprinodon nevadensis calidae* (*calidae* = hot) is found in Tecopa Hot Springs, Inyo County. Some of these fish were seen in water 104 degrees F. in temperature.

The Shoshone Nevada pupfish, *Cyprinodon nevadensis shoshone* (*shoshone* = place name derived from Shoshone Indian tribe), is found in Shoshone Spring and the outlet creek in Inyo County.

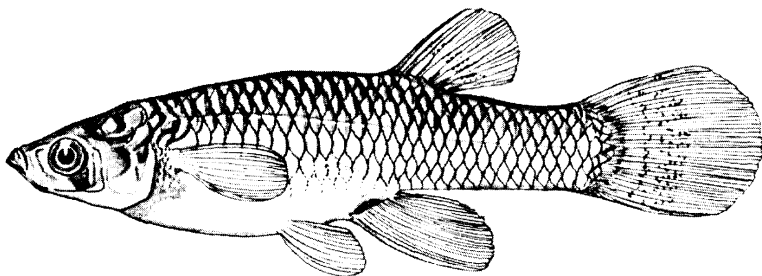
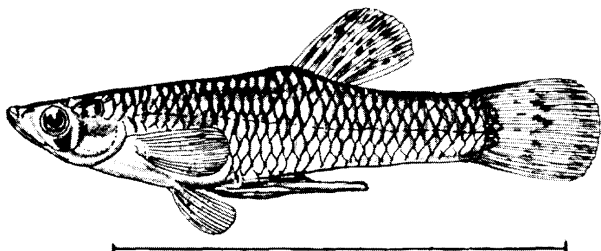
The Salt Creek pupfish, *Cyprinodon salinus* (*salinus* = salty), is found in Salt Creek on the floor of Death Valley.

The Owens Valley pupfish, *Cyprinodon radiosus* (*radiosus* = radii), is restricted to the Owens Valley in Mono and Inyo counties.

The California killifish, *Fundulus parvipinnis* (*Fundulus* = bottom; *parvipinnis* = small fin), inhabits coastal streams of southern California.

MOSQUITOFISH *GAMBUSIA AFFINIS*

Gambusia = absence of, or nothing
affinis = related



DISTINGUISHING CHARACTERISTICS

Mosquitofish belong to the topminnow family. They are small and elongated, with rounded tail fins. The dorsal fin is located behind the anal fin. The body color is light olive, with each scale dark-edged. A very narrow, dark streak runs along the sides. The head is flat above and the mouth slants obliquely upwards. The male is easily recognized by its greatly elongated anal fin, which is modified into a reproductive organ.

DISTRIBUTION IN CALIFORNIA

The mosquitofish has been widely spread throughout the State since 1922, when it was first introduced to control mosquitoes.

GENERAL INFORMATION

This species, related to the common aquarium guppy, brings forth 10 to 30 live young. The male fertilizes the female internally with the modified anal fin.

IMPORTANCE

The mosquitofish is widely used throughout the State to control mosquito larvae. This is one of the main items in the diet of this fish. It is of minor importance as forage and bait.

RELATED SPECIES

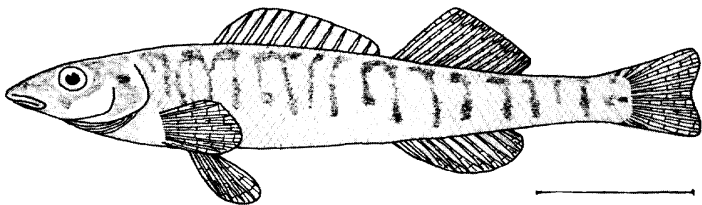
The sailfin molly, *Mollienesia latipinna* (*Mollienesia* = Mollien, French Minister of Finance; *latipinna* = broad fin) has recently become established in canals and ditches tributary to the Salton Sea, in the vicinity of the Riverside-Imperial county line. It is a popular aquarium fish. The color is black. Its fins are quite large.

LOGPERCH

Percina caprodes

Percina = perch-like

caprodes = head bound together; i.e., refers to upper jaw bound to snout



DISTINGUISHING CHARACTERISTICS

The logperch is a rather small, slender fish belonging to the perch family. It has a divided dorsal fin, the first part of which is composed of spines, and the second of rays. The mouth is overhung by the snout. Along the midline of the belly there is a single line of enlarged scales, which is separated by a slight groove from the scales on either side. The color is yellowish-green, with about 15 dark cross bands on the sides.

DISTRIBUTION IN CALIFORNIA

It is present in several waters in Beale Air Force Base in Yuba County. It was introduced there inadvertently in 1953 by Federal personnel importing warmwater game fish to stock the lakes on the air base.

GENERAL INFORMATION

The logperch belongs to a group of fish commonly known as “darters.” They are sometimes referred to as the hummingbirds of the fishes. Their broad fins, pointed heads, and small size suit them admirably for the shallow, swift streams which they usually inhabit.

IMPORTANCE

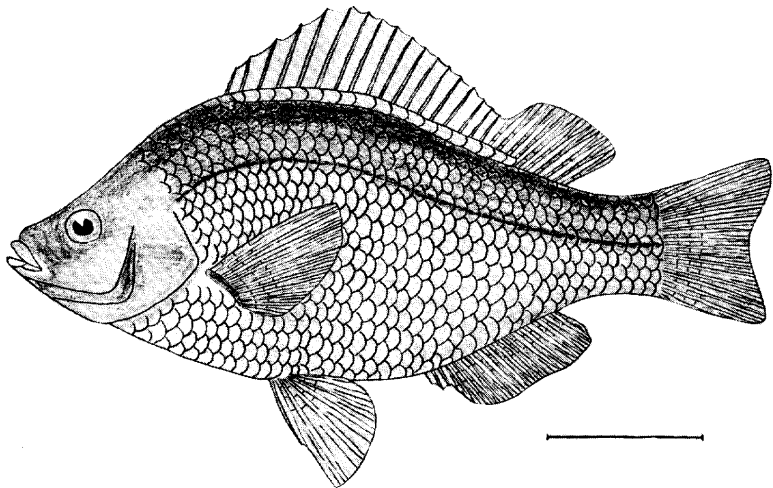
Logperch are of no importance as forage because of their small size and ability to hide among rocks to escape predation.

TULE PERCH

Hysterothorax traskii

Hysterothorax = womb fruit

traskii = after Dr. J. B. Trask, who collected the first specimens.



DISTINGUISHING CHARACTERISTICS

The tule perch superficially resembles a sunfish. It has spines and rays in both dorsal and anal fins. The dorsal fin is quite long, with 15 or more spines, and a distinct row of scales along its base. The mouth is small. Tule perch do not grow large, individuals over eight inches long being rare. This species has two color phases: one is rather pale over the entire body, while the other has dark barred coloring on the back and sides.

DISTRIBUTION IN CALIFORNIA

It has been collected from various rivers in the Central Valley from the Pit to the San Joaquin; also from the Russian, Napa, Pajaro, and Salinas rivers, Alameda Creek, and Clear Lake.

GENERAL INFORMATION

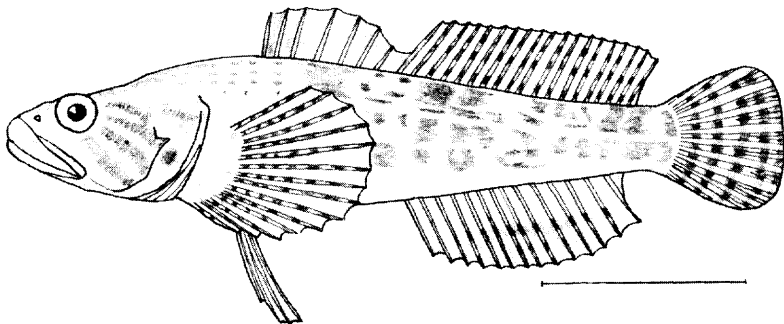
The tule perch is the only freshwater representative of the surfperch family, a group which brings forth live young. Females are fertilized internally, and the young are nourished and develop within the mother's body in sac-like compartments of the ovary. The young are born in May or June.

IMPORTANCE

It is of little economic importance. Populations are not widespread enough to be used extensively for forage by other species. A few fish are caught by anglers.

RIFFLE SCULPIN *Cottus gulosus*

Cottus = old European name
gulosus = greedy



DISTINGUISHING CHARACTERISTICS

Representatives of the sculpin family are found in both fresh and salt water. Freshwater sculpins are small, bottom-dwelling fish with large flattened heads, thin tapering bodies, and large pectoral fins. The eyes are located high on the head. The gill cover usually has one or more conspicuous spines. The body may be naked or covered almost entirely or only partly with tubercles, prickles, or scales. The mouth is large.

DISTRIBUTION IN CALIFORNIA

The riffle sculpin is common in the cooler waters of the Sacramento-San Joaquin rivers and several coastal drainages, such as the Russian River.

GENERAL INFORMATION

Sculpins are like the little man no one ever sees. They are plentiful enough, but their habits are so deliberate and their camouflage so good that we rarely see them. Their favorite habitat is stream riffles, where the rapidly flowing water and crevices in the rocks add to their cloak of invisibility.

Another common name is miller's thumb. This alludes to their shape, which is said to resemble a miller's thumb caught between the stones of an old-fashioned grist mill.

Most freshwater sculpins are stream spawners. They deposit their eggs in clusters under the larger stones in flowing waters. However, one species is known to spawn in Eagle Lake.

IMPORTANCE

Sculpins are of some importance as bait and as predators on young salmonids. Their reputation for egg-eating is deserved, but evidence shows that nearly all of the eggs they take are those swept out of the nest before the parent trout or salmon can bury them. These eggs would perish anyhow. They are known to take young trout and salmon just after they emerge from the gravel and before they swim well. Serious damage can result if a large sculpin population exists.

Food habit studies of trout, white catfish, and largemouth bass have shown sculpins to be important in their diets.

RELATED SPECIES

Six other species of sculpins inhabit the fresh waters of California. They all look very much alike.

The rough sculpin, *Cottus asperimus* (*asperimus* = most rough), is found primarily in the Pit River below Fall River Mills.

The Pit sculpin, *Cottus pitensis* (*pitensis* = of the Pit River) is found in the Pit River, primarily above Fall River Mills.

The Klamath sculpin, *Cottus klamathensis* (*klamathensis* = of the Klamath River), is found both in the Pit and Klamath drainages.

The prickly sculpin, *Cottus asper* (*asper* = rough), is found in coastal streams.

The Aleutian sculpin, *Cottus aleuticus* (*aleuticus* = of the Aleutians) is also common in coastal streams.

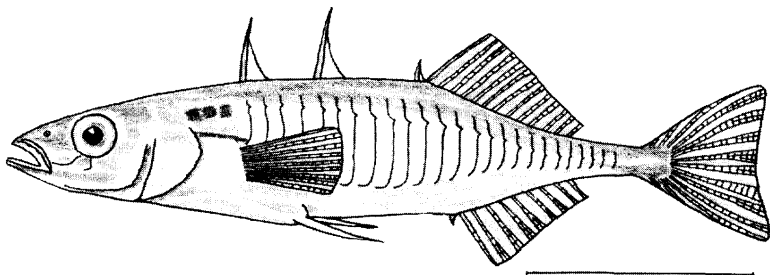
The Piute sculpin, *Cottus beldingii* (*beldingii* = for Lyman Belding, who collected early specimens), is found in Great Basin streams, such as the Truckee and Walker rivers.

At least two primarily saltwater forms, the sharpnose sculpin, *Clinocottus acuticeps* (*Clinocottus* = slanting cottus; *acuticeps* = sharp head), and the staghorn sculpin, *Leptocottus armatus* (*Leptocottus* = slender cottus; *armatus* = armed), extend their range regularly into brackish and fresh water.

THREESPINE STICKLEBACK

Gasterosteus aculeatus

Gasterosteus = belly bone
aculeatus = spined



DISTINGUISHING CHARACTERISTICS

Sticklebacks are small, rather inconspicuous fish with compressed, spindle-shaped bodies, covered with a few bony plates or shields in place of scales. Three sharp erectile spines precede the soft dorsal fin. The mouth is small, with a projecting lower jaw. The ventral fins have sharp erectile spines. Their color is greenish or olive above, grading to silvery on the lower sides and belly. At spawning time, the males have a scarlet throat and belly, blue eyes, and greenish fins. The females at this time have a pinkish throat and belly.

DISTRIBUTION IN CALIFORNIA

The threespine stickleback is found throughout the northern hemisphere, south to lower California and north Africa. Three subspecies are recognized in California:

Northern threespine stickleback, *Gasterosteus aculeatus aculeatus*, is fully armored, with plates along the sides. It is found in ocean and brackish waters.

West Coast threespine stickleback, *Gasterosteus aculeatus microcephalus* (*microcephalus* = small head), is partially armored, with 5 or 6 to 25 or 26 plates. It is widespread in fresh waters in California.

Unarmored threespine stickleback, *Gasterosteus aculeatus williamsoni*, (*williamsoni* for Lieut. R. S. Williamson, who first collected this subspecies), is usually unarmored, or may have 2 or 3 anterior plates. It is found in several coastal streams in southern California and has been introduced into the Mojave River.

GENERAL INFORMATION

The food consists of small aquatic organisms, primarily insects and crustaceans. Algae are also eaten. Breeding occurs in the late spring and

early summer. The male builds an elaborate nest of grass and sticks stuck together by a glue-like secretion. The nests may be located on the bottom or concealed in holes, cans, bottles, etc. Several females may deposit eggs in one nest. The male guards the nest until the eggs hatch and the young are on their own.

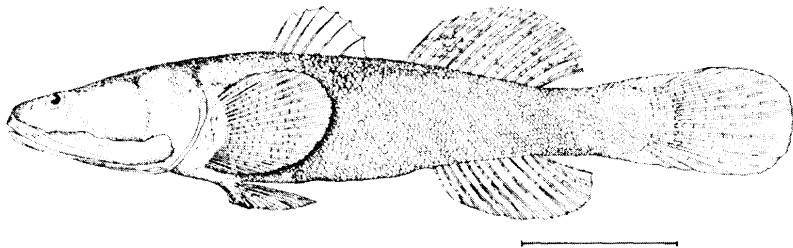
IMPORTANCE

Sticklebacks occasionally become pests in hatcheries by devouring large numbers of trout fry. They are sometimes eaten by game fish.

LONGJAW MUDSUCKER

Gillichthys mirabilis

Gillichthys = after Theodore Gill
mirabilis = wonderful



DISTINGUISHING CHARACTERISTICS

The pelvic fins are united, forming a disc. There are two dorsal fins. The tail fin is rounded. The mouth is huge, with the maxillary extending back to beyond the gill opening in adults. The color is brownish or olive above, speckled, mottled, or barred with darker shades, becoming lighter below. This species seldom exceeds 8 inches in ocean waters and 5 ½ inches in the Salton Sea.

DISTRIBUTION IN CALIFORNIA

The longjaw mudsucker is a marine species, ranging from Tomales Bay to Baja California. It has been established in the Salton Sea through introduction.

GENERAL INFORMATION

Spawning in the Salton Sea occurs from December through May. Food of the young consists mainly of plankton, while the adults feed mainly on insects and pile worms. Few fish over two years of age are found.

IMPORTANCE

The longjaw mudsucker is an important bait fish, used extensively by inland anglers. In recent years it has been imported from Baja California, since the demand has exceeded the supply in southern California.

RELATED SPECIES

The tidewater goby, *Eucyclogobius newberryi* (*Eucyclogobius* = well circle, i.e., pertaining to the cycloid scales; *newberryi* = for Dr. John Strong Newberry of Columbia College and the U. S. Geological Survey), is found in small coastal streams. This species grows to about two inches in length. The maxillaries do not extend backward, as in *Gillichthys*.

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